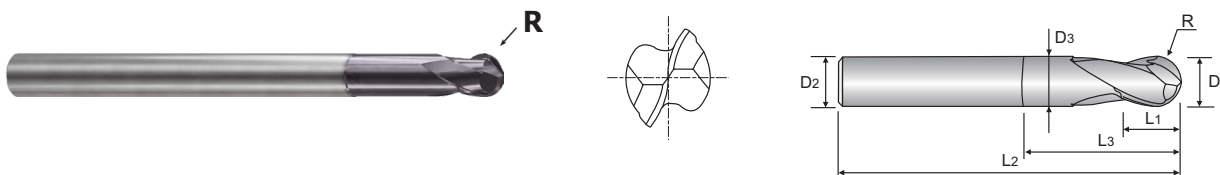


END MILLS for HARDENED MATERIAL



CARBIDE, 2 FLUTE BALL NOSE LONG LENGTH

- Designed for machining high-hardened materials, dry cutting, and high-speed cutting.
- Consistently delivers an exceptional workpiece finish and boasts high wear resistance.



p. 75

Size	Mill Dia.Tolerance (mm)	Shank Dia.Tolerance
up to Ø6	0 ~ - 0.012	h5
over Ø6	0 ~ - 0.015	

GFJ69

SERIES

Unit : mm

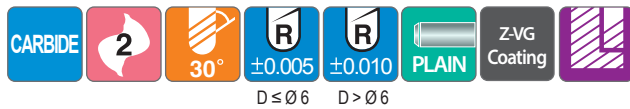
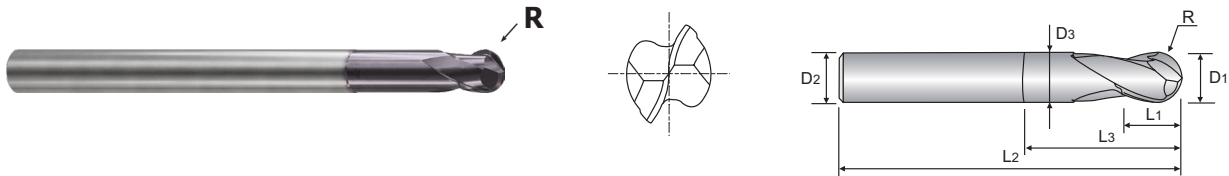
EDP No.	Radius of Ball Nose R	Mill Diameter D1	Shank Diameter D2	Length of Cut L1	Length Below Shank L3	Overall Length L2	Neck Diameter D3
GFJ69004010	R0.2	0.4	4	0.4	1	45	0.37
GFJ69004020	R0.2	0.4	4	0.4	2	45	0.37
GFJ69004030	R0.2	0.4	4	0.4	3	45	0.37
GFJ69004040	R0.2	0.4	4	0.4	4	45	0.37
GFJ69004050	R0.2	0.4	4	0.4	5	45	0.37
GFJ69005020	R0.25	0.5	4	0.5	2	45	0.45
GFJ69005040	R0.25	0.5	4	0.5	4	45	0.45
GFJ69005060	R0.25	0.5	4	0.5	6	45	0.45
GFJ69005080	R0.25	0.5	4	0.5	8	45	0.45
GFJ69006020	R0.3	0.6	4	0.6	2	45	0.55
GFJ69006030	R0.3	0.6	4	0.6	3	45	0.55
GFJ69006040	R0.3	0.6	4	0.6	4	45	0.55
GFJ69006050	R0.3	0.6	4	0.6	5	45	0.55
GFJ69006060	R0.3	0.6	4	0.6	6	45	0.55
GFJ69006080	R0.3	0.6	4	0.6	8	45	0.55
GFJ69006100	R0.3	0.6	4	0.6	10	45	0.55
GFJ69008020	R0.4	0.8	4	0.8	2	45	0.75
GFJ69008040	R0.4	0.8	4	0.8	4	45	0.75
GFJ69008060	R0.4	0.8	4	0.8	6	45	0.75
GFJ69008080	R0.4	0.8	4	0.8	8	45	0.75
GFJ69008100	R0.4	0.8	4	0.8	10	45	0.75
GFJ69010030	R0.5	1.0	4	1	3	45	0.95
GFJ69010040	R0.5	1.0	4	1	4	45	0.95
GFJ69010050	R0.5	1.0	4	1	5	45	0.95
GFJ69010060	R0.5	1.0	4	1	6	45	0.95
GFJ69010070	R0.5	1.0	4	1	7	45	0.95
GFJ69010080	R0.5	1.0	4	1	8	45	0.95
GFJ69010100	R0.5	1.0	4	1	10	45	0.95
GFJ69010120	R0.5	1.0	4	1	12	45	0.95
GFJ69010140	R0.5	1.0	4	1	14	50	0.95

► NEXT PAGE

END MILLS for HARDENED MATERIAL

CARBIDE, 2 FLUTE BALL NOSE LONG LENGTH

- Designed to machine Steels, Stainless steels, Titanium, and Heat-Resistant Super Alloys.
- Fine pitch wave geometry for high speed machining of hardened steels.



p. 75

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	0 ~ - 0.012	h5
over Ø6	0 ~ - 0.015	

GFJ69

SERIES

Unit : mm

EDP No.	Radius of Ball Nose	Mill Diameter	Shank Diameter	Length of Cut	Length Below Shank	Overall Length	Neck Diameter
	R	D1	D2	L1	L3	L2	D3
GFJ69010160	R0.5	1.0	4	1	16	50	0.95
GFJ69010200	R0.5	1.0	4	1	20	55	0.95
GFJ69012060	R0.6	1.2	4	1.2	6	45	1.15
GFJ69012080	R0.6	1.2	4	1.2	8	45	1.15
GFJ69012100	R0.6	1.2	4	1.2	10	45	1.15
GFJ69012120	R0.6	1.2	4	1.2	12	45	1.15
GFJ69015060	R0.75	1.5	4	1.5	6	45	1.45
GFJ69015080	R0.75	1.5	4	1.5	8	45	1.45
GFJ69015100	R0.75	1.5	4	1.5	10	45	1.45
GFJ69015120	R0.75	1.5	4	1.5	12	45	1.45
GFJ69015140	R0.75	1.5	4	1.5	14	50	1.45
GFJ69015160	R0.75	1.5	4	1.5	16	50	1.45
GFJ69015200	R0.75	1.5	4	1.5	20	55	1.45
GFJ69020040	R1.0	2.0	4	2	4	45	1.95
GFJ69020060	R1.0	2.0	4	2	6	45	1.95
GFJ69020080	R1.0	2.0	4	2	8	45	1.95
GFJ69020100	R1.0	2.0	4	2	10	45	1.95
GFJ69020120	R1.0	2.0	4	2	12	50	1.95
GFJ69020140	R1.0	2.0	4	2	14	50	1.95
GFJ69020160	R1.0	2.0	4	2	16	50	1.95
GFJ69020180	R1.0	2.0	4	2	18	55	1.95
GFJ69020200	R1.0	2.0	4	2	20	55	1.95
GFJ69020220	R1.0	2.0	4	2	22	60	1.95
GFJ69020260	R1.0	2.0	4	2	26	70	1.95
GFJ69020300	R1.0	2.0	4	2	30	70	1.95
GFJ69030120	R1.5	3.0	6	3	12	50	2.85
GFJ69030140	R1.5	3.0	6	3	14	55	2.85
GFJ69030160	R1.5	3.0	6	3	16	55	2.85
GFJ69030180	R1.5	3.0	6	3	18	60	2.85
GFJ69030200	R1.5	3.0	6	3	20	60	2.85

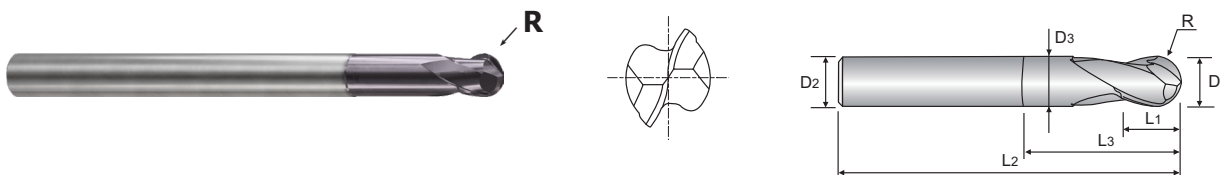
► NEXT PAGE

END MILLS for HARDENED MATERIAL



CARBIDE, 2 FLUTE BALL NOSE LONG LENGTH

- Designed for machining high-hardened materials, dry cutting, and high-speed cutting.
- Consistently delivers an exceptional workpiece finish and boasts high wear resistance.



p. 75

Size	Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
up to Ø6	0 ~ - 0.012	h5
over Ø6	0 ~ - 0.015	

GFJ69 SERIES

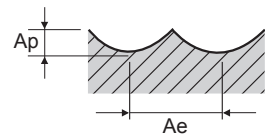
Unit : mm

EDP No.	Radius of Ball Nose R	Mill Diameter D1	Shank Diameter D2	Length of Cut L1	Length Below Shank L3	Overall Length L2	Neck Diameter D3
GFJ69030260	R1.5	3.0	6	3	26	70	2.85
GFJ69030300	R1.5	3.0	6	3	30	70	2.85
GFJ69030360	R1.5	3.0	6	3	36	80	2.85
GFJ69040120	R2.0	4.0	6	4	12	60	3.85
GFJ69040160	R2.0	4.0	6	4	16	60	3.85
GFJ69040200	R2.0	4.0	6	4	20	65	3.85
GFJ69040260	R2.0	4.0	6	4	26	70	3.85
GFJ69040300	R2.0	4.0	6	4	30	70	3.85
GFJ69040360	R2.0	4.0	6	4	36	80	3.85
GFJ69040400	R2.0	4.0	6	4	40	90	3.85
GFJ69040460	R2.0	4.0	6	4	46	90	3.85
GFJ69040500	R2.0	4.0	6	4	50	100	3.85

RECOMMENDED CUTTING CONDITIONS

Vc = (m/min.)
fz = (mm/tooth)
RPM = (rev/min.)
FEED = (mm/min.)
Ap = (mm)

GFJ69 SERIES		2 FLUTE BALL NOSE											
ISO	VDI 3323	Material Description	Parameter	Diameter (Ø)									
				0.4	0.5	0.6	0.8	1	1.2	1.5	2.0	3.0	4.0
P	1-4	Non-alloy steel	Vc	51~57	64~72	76~86	102~115	116~130	116~131	111~128	123~137	127~143	139~164
			fz	0.003~0.006	0.003~0.006	0.004~0.008	0.031~0.008	0.005~0.01	0.006~0.013	0.007~0.017	0.009~0.021	0.013~0.031	0.015~0.036
			RPM	40550~45650	40450~45650	40550~45650	40750~45650	36850~41300	30700~34800	23450~27150	19650~21750	13500~15200	11050~13050
			FEED	245~590	245~590	310~760	2515~760	340~835	340~935	340~935	340~935	340~935	340~935
			Ap	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.070~0.135	0.090~0.180	0.135~0.270	0.180~0.360
	5	Non-alloy steel	Vc	37~41	46~51	56~61	74~82	85~92	83~94	84~95	89~99	87~87	94~112
			fz	0.002~0.005	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.008	0.004~0.009	0.005~0.012	0.006~0.015	0.009~0.025	0.011~0.026
			RPM	29500~32600	29500~32600	29500~32600	29500~32600	27050~29350	22100~25000	17800~20100	14150~15750	9200~9250	7500~8900
			FEED	125~325	125~325	145~420	145~405	170~465	170~465	170~465	170~465	170~465	170~465
			Ap	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.070~0.135	0.090~0.180	0.135~0.270	0.180~0.360
	6-7	Low alloy steel	Vc	51~57	64~72	76~86	102~115	116~130	116~131	111~128	123~137	127~143	139~164
			fz	0.003~0.006	0.003~0.006	0.004~0.008	0.031~0.008	0.005~0.01	0.006~0.013	0.007~0.017	0.009~0.021	0.013~0.031	0.015~0.036
			RPM	40550~45650	40450~45650	40550~45650	40750~45650	36850~41300	30700~34800	23450~27150	19650~21750	13500~15200	11050~13050
			FEED	245~590	245~590	310~760	2515~760	340~835	340~935	340~935	340~935	340~935	340~935
			Ap	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.070~0.135	0.090~0.180	0.135~0.270	0.180~0.360
	8-9	Low alloy steel	Vc	37~41	46~51	56~61	74~82	85~92	83~94	84~95	89~99	87~87	94~112
			fz	0.002~0.005	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.008	0.004~0.009	0.005~0.012	0.006~0.015	0.009~0.025	0.011~0.026
			RPM	29500~32600	29500~32600	29500~32600	29500~32600	27050~29350	22100~25000	17800~20100	14150~15750	9200~9250	7500~8900
			FEED	125~325	125~325	145~420	145~405	170~465	170~465	170~465	170~465	170~465	170~465
			Ap	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.070~0.135	0.090~0.180	0.135~0.270	0.180~0.360
	10	High alloyed steel, and tool steel	Vc	51~57	64~72	76~86	102~115	116~130	116~131	111~128	123~137	127~143	139~164
			fz	0.003~0.006	0.003~0.006	0.004~0.008	0.031~0.008	0.005~0.01	0.006~0.013	0.007~0.017	0.009~0.021	0.013~0.031	0.015~0.036
			RPM	40550~45650	40450~45650	40550~45650	40750~45650	36850~41300	30700~34800	23450~27150	19650~21750	13500~15200	11050~13050
			FEED	245~590	245~590	310~760	2515~760	340~835	340~935	340~935	340~935	340~935	340~935
			Ap	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.070~0.135	0.090~0.180	0.135~0.270	0.180~0.360
	11.1 11.2	High alloyed steel, and tool steel	Vc	37~41	46~51	56~61	74~82	85~92	83~94	84~95	89~99	87~87	94~112
			fz	0.002~0.005	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.008	0.004~0.009	0.005~0.012	0.006~0.015	0.009~0.025	0.011~0.026
			RPM	29500~32600	29500~32600	29500~32600	29500~32600	27050~29350	22100~25000	17800~20100	14150~15750	9200~9250	7500~8900
			FEED	125~325	125~325	145~420	145~405	170~465	170~465	170~465	170~465	170~465	170~465
			Ap	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.070~0.135	0.090~0.180	0.135~0.270	0.180~0.360
H	38.1 38.2	Hardened steel	Vc	23~26	29~32	35~39	46~52	52~60	53~59	55~58	58~55	58~61	62~68
			fz	0.003~0.005	0.003~0.005	0.004~0.007	0.004~0.007	0.005~0.008	0.006~0.009	0.007~0.012	0.009~0.017	0.014~0.023	0.017~0.028
			RPM	18450~20650	18450~20650	18450~20650	18450~20650	16600~19000	14150~15750	11650~12400	9200~8750	6150~6500	4900~5450
			FEED	125~215	125~215	145~270	145~270	170~305	170~295	170~295	170~305	170~305	170~305
			Ap	0.004~0.007	0.005~0.009	0.005~0.011	0.007~0.014	0.009~0.018	0.010~0.022	0.014~0.028	0.018~0.035	0.028~0.055	0.035~0.070
	40	Chilled Cast Iron	Vc	37~41	46~51	56~61	74~82	85~92	83~94	84~95	89~99	87~87	94~112
			fz	0.002~0.005	0.002~0.005	0.002~0.006	0.002~0.006	0.003~0.008	0.004~0.009	0.005~0.012	0.006~0.015	0.009~0.025	0.011~0.026
			RPM	29500~32600	29500~32600	29500~32600	29500~32600	27050~29350	22100~25000	17800~20100	14150~15750	9200~9250	7500~8900
			FEED	125~325	125~325	145~420	145~405	170~465	170~465	170~465	170~465	170~465	170~465
			Ap	0.018~0.036	0.023~0.045	0.027~0.054	0.036~0.072	0.045~0.090	0.055~0.100	0.070~0.135	0.090~0.180	0.135~0.270	0.180~0.360
	41	Hardened Cast Iron	Vc	23~26	29~32	35~39	46~52	52~60	53~59	55~58	58~55	58~61	62~68
			fz	0.003~0.005	0.003~0.005	0.004~0.007	0.004~0.007	0.005~0.008	0.006~0.009	0.007~0.012	0.009~0.017	0.014~0.023	0.017~0.028
			RPM	18450~20650	18450~20650	18450~20650	18450~20650	16600~19000	14150~15750	11650~12400	9200~8750	6150~6500	4900~5450
			FEED	125~215	125~215	145~270	145~270	170~305	170~295	170~295	170~305	170~305	170~305
			Ap	0.004~0.007	0.005~0.009	0.005~0.011	0.007~0.014	0.009~0.018	0.010~0.022	0.014~0.028	0.018~0.035	0.028~0.055	0.035~0.070



SUPER HARDENED
HSS END MILL

COATED CARBIDE END MILL
FOR GENERAL

COATED CARBIDE END MILL
FOR HEAVY CUTTING

COATED CARBIDE END MILL
FOR HARDENED MATERIAL

COATED CARBIDE DRILL
FOR GENERAL

SOLID CARBIDE, END MILLS for Hardened Material

Specially optimized geometry and coating
for machining Hardened steels up to 65 HRC

◎ : Excellent ○ : Good

ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment		HB	HRC		
P	1	Non-alloy steel	About 0.15% C	Annealed	125			
	2		About 0.45% C	Annealed	190	13		
	3		About 0.45% C	Quenched & Tempered	250	25		
	4		About 0.75% C	Annealed	270	28		
	5		About 0.75% C	Quenched & Tempered	300	32	○	○
	6	Low alloy steel		Annealed	180	10		
	7			Quenched & Tempered	275	29		
	8			Quenched & Tempered	300	32	○	○
	9			Quenched & Tempered	350	38	○	○
	10	High alloyed steel, and tool steel		Annealed	200	15		
	11			Quenched & Tempered	325	35	◎	◎
M	12	Stainless steel	Ferritic / Martensitic	Annealed	200	15		
	13		Martensitic	Quenched & Tempered	240	23		
	14		Austenitic		180	10		
K	15	Grey cast iron	Pearlitic / ferritic		180	10		
	16		Pearlitic (Martensitic)		260	26		
	17	Nodular cast iron	Ferritic		160	3		
	18		Pearlitic		250	25		
	19	Malleable cast iron	Ferritic		130			
	20		Pearlitic		230	21		
N	21	Aluminum-wrought alloy	Not Curable		60			
	22		Curable	Hardened	100			
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable		75			
	24		≤ 12% Si, Curable	Hardened	90			
	25		> 12% Si, Not Curable		130			
	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%		110			
	27		CuZn, CuSnZn (Brass)		90			
	28		CuSn, lead-free copper and electrolytic copper		100			
	29	Non Metallic Materials	Duroplastic, Fiber Reinforced Plastic					
	30		Rubber, Wood, etc.					
S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15		
	32			Cured	280	30		
	33		Ni or Co Based	Annealed	250	25		
	34			Cured	350	38		
	35			Cast	320	34		
	36	Titanium Alloys	Pure Titanium		400 Rm			
	37		Alpha + Beta Alloys		1050 Rm			
H	38	Hardened steel		Hardened	550	55	◎	◎
	39			Hardened	630	60	◎	◎
	40	Chilled Cast Iron		Cast	400	42	◎	◎
	41	Hardened Cast Iron		Hardened	550	55	◎	◎

Recommended cutting conditions : p.75~82

SERIES

FLUTE

HELIX ANGLE

CUTTING EDGE SHAPE

SIZE MIN

SIZE MAX

PAGE

GFJ69

2

30°

BALL NOSE

R0.2

R2.0

66

LONG LENGTH

Z-VG Coating



GFJ68

2

30°

BALL NOSE

R0.1

R6.0

69

-

Z-VG Coating

